

1997

# Conversion of the uniform CPA examination to a computer-based examination Status report (American Institute of Certified Public Accountants)

American Institute of Certified Public Accountants. Board of Examiners

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# **Status Report**

## **Conversion of the Uniform CPA Examination to a Computer Based Examination**

***June 1997***

*Prepared by the Board of Examiners of the  
American Institute of Certified Public Accountants*

*AICPA, Harborside Financial Center, 201 Plaza Three, Jersey City, NJ 07311-3881*

*AICPA Online: <http://www.aicpa.org>*





# **Status Report**

## **Conversion of the Uniform CPA Examination to a Computer Based Examination**

Prepared by the AICPA Board of Examiners

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*In addition to boards of accountancy, this status report has been sent to:*

National Association of State Boards of Accountancy  
Various state licensure agencies  
Members of the AICPA Board of Directors  
State CPA Society executive directors  
Chairs of various AICPA committees  
Chairs of joint AICPA/NASBA boards and committees  
Executive Director of the American Accounting Association

June 9, 1997

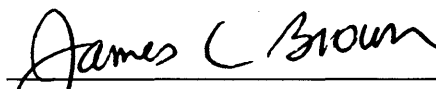
To Boards of Accountancy and Other Interested Parties:

The AICPA Computerization Task Force is pleased to present its report summarizing the responses of Boards of Accountancy and others to the AICPA Board of Examiners' request for comments on computerizing the Uniform CPA Examination. The Board of Examiners intends to continue the initiative to computerize the Examination and to form a committee to study developing and implementing a computerized Uniform CPA Examination.

Sincerely,



Stephen M. (Mike) Walker, CPA, J.D., Chair  
Board of Examiners



James L. Brown, CPA, Chair  
Computerization Task Force

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## Executive Summary

The AICPA Board of Examiners, in consultation with the National Association of State Boards of Accountancy (NASBA) and others, has begun an initiative to computerize the Uniform CPA Examination. The first step in this initiative was the creation of a Computerization Task Force to obtain comments from interested parties and to present information to NASBA and the AICPA Board of Directors.

The responses to the *Invitation to Comment—Conversion of the Uniform CPA Examination to a Computer Based Examination* indicate that computerizing the Uniform CPA Examination has the support of a wide majority of boards of accountancy and others. The respondents generally prefer a two-step computer mastery examination, but other types of examinations also have support. The two-step computer mastery examination has an all-objective section that candidates must first pass before taking the second step, which is additional sections in Auditing and Financial Accounting & Reporting consisting of problem/essay/simulation questions.

Respondents believe other issues should be researched and resolved as part of a final decision on the specific type of computer based Uniform CPA Examination. These issues include what content is to be tested on the Examination, whether essay questions are needed, whether writing skills should be assessed, and what is the proper passing standard and how it should be set. The answers to these issues will affect the nature of computerizing the Examination, and whether the Examination is computerized may affect the answers to some of these issues.

These issues are currently being addressed by the AICPA Board of Examiners and the NASBA Examinations Committee through various task forces created to study the Examination content, structure, and format, the need for essay questions, and the need to assess writing skills. The Board of Examiners and the NASBA Examination Passing Standard Subcommittee have established a new passing standard beginning with the May 1997 Examination, based on the Board of Examiners' 1996 studies.

The Board of Examiners with the NASBA Examinations Committee is now appointing a AICPA/NASBA Computerization Implementation Committee to study how to develop and implement a computer based Uniform CPA Examination.



## Background

In September 1995, the Board of Examiners issued the *Invitation to Comment — Conversion of the Uniform CPA Examination to a Computer Based Examination*. This sought to:

- ◆ Inform boards of accountancy and other interested parties of the Board of Examiners' initiatives to convert the Uniform CPA Examination to a computer based test;
- ◆ Provide information about the various types of computer based tests and their benefits and costs;
- ◆ Provide examples of several computer based test models and how they might be implemented with the Uniform CPA Examination; and
- ◆ Obtain the views of boards of accountancy and other interested parties on the feasibility and acceptability of a computer based Uniform CPA Examination and on the nature of that examination.

The Board of Examiners requested each board of accountancy, and other interested parties, to provide comments.<sup>1</sup> Comments from 25 boards of accountancy and from NASBA were received, as well as comments from 46 others. Additionally, one of the Computerization Task Force members, William Treacy, Executive Director of the Texas State Board of Public Accountancy, surveyed by telephone the administrators of the 29 boards of accountancy that did not provide a written response. Because NASBA responded, this telephone survey sought to determine if the state board did not respond in deference to the NASBA response and also to determine whether the board favored or opposed computerization of the Examination. The administrators of 26 boards responded to the telephone survey, so that comments were received from all but 3 boards. The information obtained via the telephone survey is incorporated with the comments of the other 25 boards of accountancy.

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<sup>1</sup> See Appendix A for a copy of the "Comment Form."

In the *Invitation to Comment*, the Board of Examiners sought comments on a number of specific issues. These issues are:

- ◆ Should the Uniform CPA Examination be converted to a computer based test and why or why not?
- ◆ Which types of computer based tests (CBT), such as computer linear, computer adaptive, computer mastery, or computer simulation, are most acceptable and which are unacceptable?
- ◆ Which are the biggest advantages of a computer based Uniform CPA Examination?
- ◆ Which models of the Examination (number of sections, types of CBT included, all objective or combination of formats, hierarchical or not) are most acceptable and which are least acceptable?
- ◆ What are the major impediments to implementing a computer based Uniform CPA Examination?
- ◆ What other issues need to be addressed by the Board of Examiners and boards of accountancy before implementing a computer based Uniform CPA Examination?

## Overview of Responses

Responses were received from state boards of accountancy, state CPA societies, academicians, practitioners, and other interested parties. Because the state boards are the primary users of the Uniform CPA Examination, this report emphasizes their responses and the NASBA response, although other responses are also discussed.

The responses to the questions in the *Invitation to Comment—Comment Form* are summarized in the section “**Summary of Responses to the *Invitation to Comment*.**”

Responses from boards of accountancy, NASBA, and others indicate that the majority of respondents favor computerization of the Uniform CPA Examination. Some preferred types of computerization emerged, although there is not yet a clear consensus on a single computerization model for the Examination.

Because a lack of consensus among boards of accountancy remains for many of the specific computerization issues, the Board of Examiners, along with NASBA, has initiated or will initiate strategies to study those issues. These include:

- ◆ Forming an AICPA/NASBA Computerization Implementation Committee;
- ◆ Researching the test measurement issues related to computerizing the Uniform CPA Examination;
- ◆ Exploring the development of a computerized International Uniform CPA Qualification Examination (planned successor to the Canadian Chartered Accountant Uniform CPA Qualification Examination);
- ◆ Establishing, with NASBA’s Examination Passing Standard Subcommittee, a new Uniform CPA Examination standard setting methodology based on the Board of Examiners’ 1996 standard setting studies;
- ◆ Studying the content being tested on the Uniform CPA Examination; and
- ◆ With the assistance of the NASBA Examinations Committee, determining the structure of the Uniform CPA Examination (i.e., number and content of examination sections) and format of the questions (i.e., multiple-choice, other objective answer format, and essay questions, and assessment of writing skills).

The ways in which the Board of Examiners is addressing the above issues are discussed in the section “**Issues and Comments Raised in Responses to the *Invitation to Comment—Current Status.***”



## Summary of Responses to the *Invitation to Comment*

Comment Forms were received from 61 commentators. Also, 10 other written responses that were not comment forms were received. Additionally, information was obtained from 26 boards of accountancy in a telephone survey.

Written responses were received from 25 (46%) of the 54 boards of accountancy. These jurisdictions account for approximately 70% of the Uniform CPA Examination candidates. In addition to the responses from the boards of accountancy, 46 other responses were received from:

- ◆ NASBA Examinations Committee.
- ◆ Seven state CPA societies.
- ◆ Accounting Education Change Commission.
- ◆ American Accounting Association—Professional Examinations Committee.
- ◆ Thirty-six practitioners, academicians, and others.

Below are the specific questions presented in the *Invitation to Comment—Comment Form*, a tabulation of the responses to each, and a summary of the comments made by state boards of accountancy and others.

### **Q: Should the Uniform CPA Examination be converted to a computer based test?** (Appendix A — Question A)

A clear consensus of the respondents to the *Invitation to Comment* paper favored conversion of the Uniform CPA Examination to a computer based test. Ninety-two percent (23) of the 25 boards of accountancy that filled out the *Invitation to Comment—Comment Form* favored conversion. The other 8% (2 boards) were “not sure.” Of the 26 administrators responding to the telephone survey, 14 favored conversion, 2 did not favor conversion, and 10 were not sure or had no opinion. Overall then, 73% of the state boards of accountancy favored conversion, 24% were unsure, and 4% did not favor con-

version. All seven state CPA societies responding favored conversion of the Examination to a computer based test. Of the 39 other responses, 26 (67%) favored conversion, 6 (15%) did not favor conversion, and 7 (18%) were not sure.

**Q: What are the primary reasons for your answer?** (Appendix A — Question B)

The primary reasons given by those “favoring” conversion are as follows:

	<b><u>Number Indicating Reason</u></b>	
	<b>Boards</b>	<b>Others</b>
<b>Benefits to candidates</b>		
◆ <i>Increased frequency of administration</i>	11	11
◆ <i>Enhanced administration conditions — more and better site conditions</i>	9	2
◆ <i>Rapid dissemination of grades</i>	9	9
◆ <i>Reduced testing time</i>	5	
<b>Enhanced examination quality</b>		
◆ <i>Improved psychometrics (measurement precision, reliability, grading accuracy)</i>	8	9
◆ <i>More complex objective responses and ability to test more realistic practice questions, such as research and judgment skills</i>	6	12
◆ <i>Ability to quickly modify questions</i>		3
<b>Benefits for boards of accountancy</b>		
◆ <i>Simplify board of accountancy workload (peak periods, site and proctor procurement, tracking of examination material shipments)</i>	8	7
◆ <i>Enhance examination security</i>	5	6
<b>Technology benefits</b>		
◆ <i>Direction of other licensing examinations, keep pace with the profession, and take advantage of current and future technology</i>	3	8

The reasons given by those that were “unsure” of computerization were:

- ◆ *Cost seems prohibitive.*
- ◆ *Lack of computer facilities.*
- ◆ *Concerns of adequate security.*
- ◆ *Logistical issues in administration to a large number of candidates.*
- ◆ *Bias against those unfamiliar with computers.*
- ◆ *Computer malfunction.*
- ◆ *Doubt CBT can better test concepts.*
- ◆ *Inability to review previous work.*

The primary reasons given by those “not favoring” conversion are as follows:

- ◆ *Communication skills are important and can't be tested on computer.*
- ◆ *Computerization requires non-disclosure.*
- ◆ *Security concerns.*
- ◆ *Increased cost.*
- ◆ *Computer will impede development of practice related questions.*
- ◆ *Will result in reduced standardization and control of administration.*
- ◆ *Shorter exam for easy passes trivializes the process of passing the CPA Examination.*
- ◆ *Form may subsume substance.*

**Q: Which types of computer based tests (computer linear, computer adaptive, computer mastery, or computer simulation) are acceptable and which are unacceptable? (Appendix A — Question C)**

The *Invitation to Comment* described the four basic types of computer based tests (CBT):

- ◆ Computer linear test (CLT) – provides a predetermined set of questions to each candidate;
- ◆ Computer adaptive test (CAT) – a candidate's answers to prior questions are used to select the candidate's next questions;
- ◆ Computer mastery test (CMT) – batches of questions are given and the candidate's responses are used to determine if the candidate demonstrates mastery or lack of mastery, with additional batches of questions given until a clear result is known; and
- ◆ Computer simulation test (CST) – an open-ended situation is provided and the candidate's performance is assessed.

Commentors were requested to rank these four basic CBT types from **Most Acceptable** (rating = 1) to **Least Acceptable** (rating = 4) for usage on the Uniform CPA Examination and indicate separately if any of the CBT types were unacceptable. Table 1 summarizes the ranking of the types of computer based tests. The information presented in Table 1 is based on responses by 23 boards of accountancy and 40 responses by state CPA societies, academicians, and practitioners grouped into the “Others” category in the table.

**Table 1**  
**Average Ranking and Acceptability of CBT Types**

CBT Type	Average Ranking 1= Most Acceptable 2= 2nd Most Acceptable 3= 3rd Most Acceptable 4= Least Acceptable			Do you find this CBT Type Unacceptable?		
	BOA	Others	Combined	BOA	Others	Combined
Linear	3.3	2.8	2.9	6	7	13
Adaptive	2.1	2.3	2.3	2	9	11
Mastery	1.6	2.2	2.0	1	6	7
Simulation	2.9	2.6	2.8	3	5	8
BOA = Boards of Accountancy, Others = State CPA Societies, Academicians, Practitioners						

The ratings indicated that the computer mastery test (highlighted) is rated most acceptable and the computer linear test least acceptable. In fact, six boards of accountancy found the CLT type unacceptable.

***Q: Which Uniform CPA Examination models (five models presented) are acceptable and which are unacceptable? (Appendix A — Question D)***

The *Invitation to Comment* described the following five computer based Uniform CPA Examination models:

- #1 One-section, all-objective CMT (all content on the examination would be included in one section and a candidate would either pass or fail the entire examination).
- #2 Two-section, all-objective CMT (content split between auditing domain and financial reporting domain and a candidate would have to pass both sections to complete the examination process).
- #3 Hierarchical three sections: prerequisite CMT and two essay/simulation sections.
- #4 Current four sections: each section a combination of CAT, CMT, and CST.
- #5 Three sections: same as current four sections above, except Business Law & Professional Responsibilities content domain would be merged into other sections.



Commentors were given the opportunity to add an additional model not included above. Commentors were requested to rank these Uniform CPA Examination models from **Most Acceptable** (rating = 1) to **Least Acceptable** (rating = 5) for usage on the Uniform CPA Examination and indicate separately if any of the models were unacceptable. Table 2 summarizes the ranking of the Uniform CPA Examination computer based models presented. The information presented in Table 2 is based on 23 responses by boards of accountancy and 40 responses by state CPA societies, academicians, and practitioners grouped into the “Others” category in the Table.

**Table 2**  
**Average Ranking and Acceptability**  
**of Uniform CPA Examination Computer Based Models**

Uniform CPA Examination Computer Based Models	Average Ranking 1= Most Acceptable 2= 2nd Most Acceptable 3= 3rd Most Acceptable 4= 4th Most Acceptable 5/6= Least Acceptable			Do you find this CBT Type Unacceptable?		
	BOA	Others	Combined	BOA	Others	Combined
#1-One Section	3.7	4.9	4.4	6	21	27
#2-Two Sections	3.1	4.1	3.7	2	18	20
#3-Hierarchical	2.2	2.3	2.3	1	0	1
#4-Four Section	3.3	2.4	2.7	5	3	8
#5-Three Sections	3.3	2.5	2.8	5	2	7
BOA = Boards of Accountancy, Others = State CPA Societies, Academicians, Practitioners						

The ratings made by state boards indicated that the most preferred model is the three-section, hierarchical (#3, highlighted in the table) and the least acceptable model is the one-section, all-objective (#1). Slightly more than 20% (5 to 6) of the 23 boards of accountancy responding to Question D found models #1 (one section, all objective), #4 (current four sections), and #5 (three sections) to be unacceptable, while only 4% (1) of the boards found model #3 (three sections, hierarchical) to be unacceptable.

Two additional models were suggested. These were:

- ◆ Eight-section hierarchical — six sections (all-objective CMT) core competencies assessed and two sections (essay/simulation – open book) 50% writing skills and 50% technical skills assessing higher-level problem-solving and creative thinking skills.
- ◆ Four-section CAT or CMT.

Some respondents added comments. These were:

### **One-Section Model**

- ◆ *All-objective examination won't test skills needed in practice.*
- ◆ *One-section all-objective examination is best.*
- ◆ *Two sections not needed; if Auditing is crucial, it can be weighted more in one section; writing skills are not needed to protect the public; higher-level skills can be tested with multiple-choice questions.*
- ◆ *Definitely against one single part for the entire examination.*

### **Multiple Section Model**

- ◆ *Two-section all-objective examination is best because sections are highly correlated and essays are highly correlated with multiple-choice items.*
- ◆ *Strengths in one area should not offset weaknesses in another.*
- ◆ *Writing skills can be eliminated.*
- ◆ *Business Law should be integrated into other sections, consistent with findings of practice analysis.*
- ◆ *Writing/communication skills and higher-level reasoning are so important they must be tested using essay/problem solving questions with written answers.*
- ◆ *Auditing is the unique area of expertise for CPAs, therefore there should always be a requirement to pass an exam segment devoted to Auditing.*

**Q: If you favor conversion of the CPA Examination to a CBT, please check the rating that best indicates how you feel about the following examination structures (five structures presented).** (Appendix A — Question E)

The Invitation to Comment presented the following descriptions of five different ways a computer based Uniform CPA Examination might be structured:

- #1 One section (question format could be all-objective or a combination of objective and essay/problem/simulation).
- #2 Two sections (question format could be all-objective or a combination of objective and essay/problem/simulation).
- #3 Three sections: hierarchical (all-objective prerequisite section before being allowed to take two essay sections).
- #4 Four sections: same as current examination (question format would be a combination of objective and essay/problem/simulation).
- #5 Three sections: incorporating the content of Business Law & Professional Responsibilities into the three remaining sections (question format would be a combination of objective and essay/problem/simulation).

Commentors were requested to rate the proposed structures for a computer based Uniform CPA Examination from **Strongly Favor** (rating = 1) to **Adamantly Against** (rating = 5). Commentors could also indicate if they were unsure of how they would rate a particular structure. The results of this question are summarized in Table 3.

**Table 3**  
**Number of Responses and Average Ratings of Possible Structures**  
**of a Computer Based Uniform CPA Examination**

Structure		Strongly Favor [1]	Favor [2]	Neutral [3]	Against [4]	Adamantly Against [5]	Unsure	Average Rating
#1 One section	BOA	4	5	2	4	8	0	3.3
	Others	1	3	4	12	18	2	4.1
	TOTAL	5	8	6	16	26	2	3.8
#2 Two sections	BOA	2	8	4	7	2	0	3.0
	Others	1	4	10	10	14	1	3.8
	TOTAL	3	12	14	17	16	1	3.5
#3 Three sections Hierarchical	BOA	8	6	5	4	0	0	2.2
	Others	15	10	9	2	3	0	2.2
	TOTAL	23	16	14	6	3	0	2.2
#4 Four sections	BOA	4	6	5	4	3	0	2.8
	Others	12	18	5	0	3	1	2.1
	TOTAL	16	24	10	4	6	1	2.3
#5 Three sections	BOA	2	8	4	6	3	0	3.0
	Others	3	23	10	1	2	0	2.4
	TOTAL	5	31	14	7	5	0	2.6
BOA = Boards of Accountancy, Others = State CPA Societies, Academicians, Practitioners								

The ratings made by state boards indicated that the preferred structure is the three-section, hierarchical (#3, highlighted) and the least preferred structure is the one section (#1). None of the boards of accountancy were adamantly against structure #3; however, 14% (3 of 22) were adamantly against the second most preferred structure (#4), and 35% (8 of 23) were adamantly against the one-section structure. Ratings by others indicated that, like the state boards, the least preferred model was the one section (#1). However, the state CPA societies, academicians, and practitioners had a slight preference for the four-section model (#4, highlighted) over the three-section model preferred by the state boards of accountancy.

The following comments were made by respondents in response to Question E:

- ◆ *The more sections, the more hurdles, and therefore the more failures; most credentialing exams have one section. Because of high correlation between sections, Uniform CPA Examination needs only one section.*
- ◆ *Hierarchical examination would be difficult to administer.*
- ◆ *Hierarchical examination is the best one, it allows computerization to proceed but not excessively fast.*
- ◆ *Eliminating those candidates with a low probability of success, and examining more in-depth those with a higher probability of success, is attractive. However, all-objective is probably more efficient, and Auditing should be tested separately.*
- ◆ *Four section model would represent improvement if simulations were included.*
- ◆ *Incorporating business law into other sections is desirable.*
- ◆ *Important to preserve problem solving and essay type questions.*
- ◆ *Supercompetency in one area should not be allowed to compensate for lack of competency in another.*

**Q: If you favor conversion of the CPA Examination to a CBT, please check the rating that best indicates how you feel about the following examination formats (five question formats presented).** (Appendix A — Question F)

The *Invitation to Comment* paper presented descriptions of the following five question formats:

1. Four-option multiple-choice
2. Other objective answer formats (OOAFs)
3. Essay-type questions
4. Problem-type questions
5. Simulations

As discussed in the *Invitation to Comment*, the preferred question format is important in determining the nature of a computerized examination because the types of questions on the Examination may affect the frequency with which the Examination can be given and the speed with which questions can be graded, as well as providing other benefits.

Commentors were requested to rate how they felt about each of these five formats from **Strongly Favor** (rating = 1) to **Adamantly Against** (rating = 5). Commentors could also indicate if they were unsure of how they felt about a particular format. The results of this question are summarized in Table 4.



**Table 4**  
**Number of Responses and Average Ratings of Question Formats**

Format		Strongly Favor [1]	Favor [2]	Neutral [3]	Against [4]	Adamantly Against [5]	Unsure	Average Rating
1 Four-option multiple-choice	BOA	8	12	1	1	0	0	1.8
	Others	14	21	0	0	0	1	1.6
	TOTAL	22	33	1	1	0	1	1.7
2 Other objective answer format (OOAFs)	BOA	4	15	3	0	0	0	2.0
	Others	8	20	5	0	2	1	2.1
	TOTAL	12	35	8	0	2	1	2.0
3 Essay-type questions	BOA	5	8	3	4	1	0	2.4
	Others	19	11	4	1	1	0	1.7
	TOTAL	24	19	7	5	2	0	2.0
4 Problem-type questions	BOA	4	13	5	0	0	0	2.0
	Others	24	12	0	0	0	0	1.3
	TOTAL	28	25	5	0	0	0	1.6
5 Simulation	BOA	4	6	4	3	3	2	2.8
	Others	9	16	2	4	0	4	2.0
	TOTAL	13	22	6	7	3	6	2.3

BOA = Boards of Accountancy, Others = State CPA Societies, Academicians, Practitioners

The ratings made by state boards indicated that the four-option multiple-choice format was the most preferred format (highlighted), followed respectively by OOAFs, problems, essays, and simulations. One state board was adamantly against essays and three were adamantly against simulations. No state board was adamantly against multiple-choice, OOAF, or problem-type questions. Responses by others, however, indicated that problem-type questions were most preferred (highlighted), followed by four-option multiple-choice, essays, OOAFs, and simulations.

The following comments were made by state boards and others in response to Question F:

**Multiple-choice/objective format**

- ◆ *Multiple-choice format is best because it is the easiest to compile a large item bank and develop multiple examinations, and it is most appropriate for computer adaptive test.*
- ◆ *Other formats yield no more information than multiple-choice; essays are too subjective, less reliable, and too costly; writing should not be scored.*
- ◆ *Favor objective questions based on immediate grading.*
- ◆ *Quicker grading is best.*
- ◆ *Against all-objective.*

### Essay/simulation format

- ◆ *In favor of essays only if writing skills can be assessed.*
- ◆ *Simulation is impractical, yet it would be best to have.*
- ◆ *Simulation is best measure of ability in the real world, however it is not practical. All-objective can be an effective alternative.*
- ◆ *Exam should include both essays and objective questions.*
- ◆ *Strongly favor including essays.*

**Q: Please indicate, by placing a check in the appropriate column, what you believe are the two greatest benefits of computerized testing.** (Appendix A — Question G)

The *Invitation to Comment* paper presented several benefits of computerized testing relative to paper-and-pencil testing. Commentors were requested to identify what they saw as the top two benefits. The results of this question are summarized in Table 5.

**Table 5**  
**Identification of the Top Two Benefits of Computer Based Testing**

Benefits	Greatest Benefit			Second Greatest Benefit		
	BOA	Others	Total	BOA	Others	Total
1. Test research, recognition, judgment skills	5	11	16	2	2	4
2. More complex questions	0	1	1	2	4	6
3. Increased measurement precision	9	1	10	1	4	5
4. Increased accuracy of recording candidate answers	0	1	1	0	0	0
5. Simplification of board workload	1	8	9	2	3	5
6. Improved examination security	1	0	1	1	1	2
7. Enhanced administration conditions	1	0	1	5	2	7
8. Increased examination flexibility—more than two prescribed dates	5	12	17	6	4	10
9. Reduction in testing time	0	0	0	2	1	3
10. Quicker grade reporting	2	4	6	3	6	9
11. Reduced handling of question and answer materials	0	1	1	0	6	6
Number Responding	24	39	63	24	33	57
BOA = Boards of Accountancy, Others = State CPA Societies, Academicians, Practitioners						

The responses by state boards of accountancy indicated that increased measurement precision was seen as the greatest benefit (highlighted), and that increased flexibility in examination administration was seen as the second greatest benefit (highlighted). Responses by others indicated that increased flexibility was seen as the greatest benefit (highlighted) and that quicker grade reporting and reduced handling of question and answer materials were seen as the second greatest benefits (highlighted). However, several of the benefits appeared to be important to the commentors.

The following comments were made in responding to Question G:

- ◆ *Most of these benefits are significant.*
- ◆ *Computerized examination provides an opportunity to offer more complex questions and better measure and test research, recognition, and judgment skills.*
- ◆ *All of the above are benefits.*
- ◆ *Increased measurement precision is greatest benefit if CAT is the model. This is not true for other models. CAT is more flexible for scheduling exams. Without these benefits, the full value of computerization is lost.*
- ◆ *No single benefit warrants CBT, however, the benefits collectively do warrant CBT.*

**Q: Please indicate, by placing a check in the appropriate column, what you believe are the two greatest impediments to computerized testing.** (Appendix A — Question H)

The *Invitation to Comment* paper presented several impediments to computerized testing relative to the current paper-and-pencil testing. Commentors were requested to identify what they saw as the two greatest impediments. The results of this question are summarized in Table 6.

**Table 6**  
**Identification of the Two Greatest Impediments to Computer Based Testing**

Impediment	Greatest Impediment			Second Greatest Impediment		
	BOA	Others	Total	BOA	Others	Total
1. Examination fees charged candidates	4	3	7	2	9	11
2. Contracting of examination administration	4	3	7	2	6	8
3. Change statutes or regulations	7	17	24	0	2	2
4. Availability and approval of computer sites	2	5	7	10	9	19
5. Possible (currently unknown) legal issues	3	8	11	3	8	11
Number Responding	20	36	56	17	34	51
BOA = Boards of Accountancy, Others = State CPA Societies, Academicians, Practitioners						

The responses by state boards of accountancy indicated that changing statutes or regulations (highlighted) was the biggest impediment (see Appendix B for a list of legislative considerations), and that availability and approval of computer sites (highlighted) was seen as the second greatest impediment. Responses by state societies, academicians, and practitioners indicated agreement with the boards of accountancy that changing statutes or regulations would be the biggest impediment, and that availability and approval of computer sites (tied with examination fees charged to candidates) would be the second greatest impediment.

The following comments were made by boards of accountancy and others in responding to Question H:

- ◆ *All impediments can be overcome.*
- ◆ *Biggest impediment is if skills such as communication and problem solving are not tested.*
- ◆ *Greatest impediment is security.*
- ◆ *Largest problem is item bank size.*
- ◆ *Examination fees may be higher, but all the other charges for the current exam are also burdensome, and the wait for the candidate to receive grades is excessive. All the other issues may present some level of difficulty, but they are administrative.*
- ◆ *Need to educate boards and do thorough beta test.*
- ◆ *Biggest impediment is to secure approval of all state boards of accountancy.*
- ◆ *No essays is the biggest disadvantage.*



**Q: On-demand examination administration appears to require an all-objective examination, as opposed to an examination that includes essay/problem/simulation-type questions. Do you favor an all-objective examination, administered on demand, or do you favor an examination that includes essay/problem/simulation-type questions, administered fewer times a year on common dates?** (Appendix A — Question I)

It was anticipated that retention of essays or problems in a computer based test would be a difficult issue to resolve. Consequently, commentators were asked to decide between a computer based test that did not contain essays/problems/simulations (i.e., all-objective) and a computer based test that did. The results of commentators' responses to Question I are presented in Table 7.

**Table 7**  
**Number of Respondents Indicating Preference For Examination Type**

<b>Examination Type</b>	<b>BOA</b>	<b>Others</b>	<b>Total</b>
All-Objective, on demand	9	5	14
Essay/Problem/Simulation a few times a year	13	30	43
Number Responding	22	35	57
BOA = Boards of Accountancy, Others = State CPA Societies, Academicians, Practitioners			

The results in Table 7 indicated that there was a preference by state boards of accountancy and others to retain essays or problems (highlighted) in the Examination at the cost of not realizing all of the benefits of computerization. This preference was very strong for the state societies, academicians, and practitioners. There were also, however, a significant number of state boards of accountancy that preferred to discontinue essay questions. This diversity of opinion, which is also reflected in the comments made by respondents, indicates that further study of this important issue is required.

The following comments were made by those responding to Question I:

- ◆ *Essays/problems/simulations needed to test skills needed in practice.*
- ◆ *Need essay/problems/simulations to test communication skills.*
- ◆ *The desirability of computerized testing hinges on the on-demand examination administration. If you have to do scheduling for essay or simulation, the desirability of computerized testing is lost.*
- ◆ *Simulations and problem questions should be incorporated as they are developed.*
- ◆ *Current availability of test sites would present problems in getting all candidates tested on common dates. We favor essay/problem questions, however.*
- ◆ *On-demand outweighs advantages of essays.*

- ◆ *On-demand is best.*
- ◆ *Preferred exam includes both.*
- ◆ *Adamantly against all-objective.*
- ◆ *On-demand would diminish the value of the CPA Exam.*

## Preferred Model

The responses to the *Invitation to Comment* indicate that computerizing the Uniform CPA Examination has the support of a wide majority of state boards and others. The responses indicate a slight preference for a computer mastery, hierarchical examination that requires candidates to pass an all-objective section before they are eligible to take additional sections in Auditing and Financial Accounting & Reporting. These additional Auditing and Financial Accounting & Reporting sections would consist only of essay/problem/simulation-type questions.

## Other Issues Raised

Other written comments, which were not directly related to the questions on the Comment Form, indicated that many boards and individuals had concerns about issues that should be addressed before, or simultaneously with, computerization. These comments are classified as:

- ◆ *Content of the Examination.* Content should be broadened to include subject matter such as technology, business environment, economics, ethics, and team decision-making skills. Also, content should be narrowed to eliminate topics with less current relevance.
- ◆ *The level of skills assessed.* Some respondents indicated cognitive skills should be assessed at the highest level possible, and skills such as critical thinking, research, and communications should be emphasized on the examination as much as possible.
- ◆ *Appropriateness of essay questions.* Some respondents implied essays must be retained and others questioned the value added to the examination by including essay questions.
- ◆ *Appropriateness and manner of assessing writing skills.* Some respondents questioned the benefits of testing writing skills and others thought it important to test writing skills.
- ◆ *Number of examination sections.* Some thought a computerized examination could move to fewer sections than the current four sections.
- ◆ *Readdressing the Examination's passing standard.* Some thought a revised passing standard should be developed.

The activities of the Board of Examiners that address these and other issues are discussed in the next section: **“Issues and Comments Raised in Responses to the *Invitation to Comment*—Current Status.”**

## Issues and Comments Raised in Responses to the *Invitation to Comment*—Current Status

In addition to the responses summarized previously, the commentors raised many issues relating to the examination and its computerization. The Board of Examiners (BOE) is currently addressing many of these issues or has developed plans to address them. The two activities in which the BOE is currently engaged that address many of the commentors' concerns are the appointment of a Content Oversight Task Force and the completion of a series of standard setting studies. Each of these is described below. Additionally, the BOE has planned a series of test measurement studies to provide more information about critical issues related to computerization. These studies, described in the subsection "**Psychometric Research Studies**," also address issues raised by commentors. Finally, the BOE, together with the NASBA Examinations Committee, is in the process of appointing an AICPA/NASBA Computerization Implementation Committee. The committee's scope is presented in the section "**AICPA/NASBA Computerization Implementation Committee**."

### Content Oversight Task Force

The Board of Examiners has appointed a Content Oversight Task Force (COTF), which has been charged to ensure that the content specifications of the Uniform CPA Examination reflect the knowledge and skills needed by newly licensed CPAs to competently practice public accountancy. To fulfill its charge, the COTF will address many of the issues that commentors indicated needed to be addressed prior to computerizing the Uniform CPA Examination. The COTF will be engaged in the following activities:

- ◆ Establishing a methodology to ensure timely updates of Uniform CPA Examination content.
- ◆ Evaluating the content currently tested on the Uniform CPA Examination for its relevance to the current practice of newly licensed CPAs.

- ◆ Evaluating additional content not currently tested on the Uniform CPA Examination for its relevance to the current practice of newly licensed CPAs.
- ◆ Evaluating the structure of the Uniform CPA Examination, including the number of sections and content of each section.
- ◆ Evaluating the use of various question formats, including multiple-choice, other objective answer formats, essays, and problems.
- ◆ Evaluating the writing skills assessment on the Uniform CPA Examination.
- ◆ Identifying additional skills (such as cognitive skills, research skills, and communication skills) that are testable and appropriate for the Uniform CPA Examination.

To assist the COTF in fulfilling its charge, the Board of Examiners has issued *Invitation to Comment—Updating the Uniform CPA Examination Content Specifications* to boards of accountancy and other interested parties. The purpose of this *Invitation to Comment* is to obtain information and comments regarding the knowledge and skills that boards of accountancy and others believe should be assessed on the Uniform CPA Examination.<sup>2</sup>

## **New Passing Standard—May 1997**

In August 1996, the Board of Examiners completed a series of studies applying a new standard setting method to the Uniform CPA Examination. These studies produced a passing score on the Uniform CPA Examination that is based on the professional judgment of CPAs familiar with both the content of the Uniform CPA Examination and the work of newly licensed CPAs. In January 1997, the Board of Examiners and the Examination Passing Standard Subcommittee of the NASBA Examinations Committee approved a new passing standard for the Uniform CPA Examination. The new passing standard will go into effect with the May 1997 Uniform CPA Examination. Standard setting studies are expected to be conducted annually to keep the passing standard current.

## **Psychometric Research Studies**

In addition to the appointment of the COTF and completion of the standard setting studies, the Board of Examiners recognizes that there are psychometric issues that require further study before computerization can proceed. Consequently, the following research studies are planned:

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<sup>2</sup> A copy of the *Invitation to Comment* can be obtained by contacting the AICPA Order Department at 1-800-TO-AICPA (1-800-862-4272) and selecting option #1. Request a copy of Product No. 875024.

*Examination dimensionality.* The *dimensionality* of an examination refers to the number of statistically independent content areas measured by a single examination. In general, if all content areas in an examination are statistically related, such tests are considered “unidimensional.” “Multidimensional” examinations are those in which some content areas are statistically independent of other content areas. The psychometric models used to develop computer based tests generally require each section of the test to be unidimensional. Statistical analyses can be performed on examination data to assess dimensionality. The results of such analyses can be used to make decisions about the number of sections an examination should have and which areas should be combined or separated.

The dimensionality of a test does not necessarily correspond to the number of content areas in the test. For example, content areas in which candidate performance is highly correlated may be found, statistically, to be one dimension. Thus, it may be possible to combine several examination sections and still have a unidimensional test. Conversely, investigation of a test’s dimensionality may reveal that an area previously considered to be unidimensional is in fact multidimensional and should be assessed separately.

*Item response theory (IRT) feasibility.* To produce a computer based test, a statistical model referred to as *item response theory* (IRT) must be applied to the examination data. Item response theory measures the probability that questions will be answered correctly across the various candidate ability levels. This is important because candidates will receive different examination questions and their results must be equated. To apply this model correctly, several statistical assumptions about the examination data must be met. If these assumptions are not met, candidates may be inappropriately passed or failed.

An assessment of how well the Uniform CPA Examination data meet the assumptions of IRT needs to be conducted. Such an assessment will indicate whether it is appropriate to use IRT or what steps need to be taken before IRT can be applied appropriately. For example, an IRT feasibility study may indicate that some OOAF questions violate the IRT statistical model. A decision may then be made to completely eliminate the use of OOAFs or a decision may be made to undertake the development of OOAFs that can be used with IRT.

*CBT model assessment.* To assess the adequacy of various CBT models, several types of studies are planned. These studies involve producing computer-generated examination data under several different conditions and applying that data to different CBTs. Results of these studies can be used to make informed decisions on issues such as the needed item bank size, number of items to include in testlets, assessment of various algorithms for selecting items, and consistency of CBT models in producing candidates’ scores and making pass/fail decisions.

## **AICPA/NASBA Computerization Implementation Committee**

The results of the psychometric studies discussed in the last section will provide fundamental information for making critical decisions regarding how to computerize the Uniform CPA Examination. Thus, the completion of these studies is essential before computerization can proceed. However, the BOE also recognizes that other activities need to occur simultaneously with the psychometric studies. To assure completion of these other activities, the BOE and NASBA Examinations Committee are in the process of appointing a committee to oversee the implementation of a computerized Uniform CPA Examination.

The committee is charged with the development of a computerization model for the Uniform CPA Examination. This committee will report to the Board of Examiners and be advisory in nature. A primary responsibility of the committee will be to ensure that boards of accountancy and NASBA are kept fully informed as the process is being undertaken. The committee will:

- ◆ Oversee the projects necessary to address the issues discussed in the previous sections.
- ◆ Establish the groups necessary to address the issues.
- ◆ Determine the resources needed.
- ◆ Draft communications to boards of accountancy and NASBA on the process of the Committee's work.
- ◆ Develop a prototype model of the computerized Uniform CPA Examination.
- ◆ Establish the timetable for accomplishing computerization.
- ◆ Develop recommendations for changes in laws and statutes.

# APPENDIX A

## Invitation to Comment Conversion of the Uniform CPA Examination to a Computer Based Examination—Comment Form

### COMMENT FORM

DEADLINE DATE: FEBRUARY 15, 1996

#### INVITATION TO COMMENT CONVERSION OF THE UNIFORM CPA EXAMINATION TO A COMPUTER BASED EXAMINATION

The AICPA Board of Examiners is studying whether to convert the Uniform CPA Examination to a computer based test. As a basis for gathering information on whether to convert, the Board of Examiners requests each board of accountancy and other interested parties to complete this seven-page comment form after reading the attached *Invitation to Comment* paper.

#### RESPONDENT

Board of Accountancy \_\_\_\_\_

Contact Person \_\_\_\_\_

#### Other Interested Parties

Name \_\_\_\_\_

Affiliation \_\_\_\_\_

Address \_\_\_\_\_

- A. Do you favor the conversion of the Uniform CPA Examination to a computer based test?  
(Please check one)

☐ Yes

☐ No

☐ Not Sure

- B. What are the primary reasons for your answer?

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- C. If you favor conversion of the CPA Examination to a CBT, please rank order the types of CBTs presented in the *Invitation to Comment* paper from most acceptable (1) to least acceptable (4). Also please indicate, by placing a check in the appropriate column, which if any of the CBT types you find unacceptable.

CBT Type	<b>Ranking</b> <b>1=Most Acceptable</b> <b>2=2nd Most Acceptable</b> <b>3=3rd Most Acceptable</b> <b>4=Least Acceptable</b>	<b>Do you find</b> <b>this CBT Type</b> <b>Unacceptable?</b>
Computer Linear		
Computer Adaptive		
Computer Mastery		
Computer Simulation		

Comments \_\_\_\_\_

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- D. Please rank order the five models from the most acceptable to the least acceptable. Use 1 to indicate the model you find most acceptable and 5 to indicate the model you find least acceptable. Also, indicate which of the models, if any, you find unacceptable by placing a check in the appropriate column. If you believe that another model should be considered, please describe it below and include it in your rankings, going from 1 (Most Acceptable) to 6 (Least Acceptable).

Models	<b>Ranking</b> <b>1=Most Acceptable</b> <b>2=2nd Most Acceptable</b> <b>3=3rd Most Acceptable</b> <b>4=4th Most Acceptable</b> <b>5/6=Least Acceptable</b>	<b>Do you find</b> <b>this CBT Type</b> <b>Unacceptable?</b>
#1–One Section, all objective		
#2–Two Sections, all objective		
#3–Three Sections; Hierarchical		
#4–Four Sections; Current Structure, combination of CLT CAT, CMT, and CST		
#5–Three Sections, Combination of CLT CAT, CMT, and CST		
#6–Additional Model (not included in paper)		



Comments \_\_\_\_\_

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- E. If you favor conversion of the CPA Examination to a CBT, please check the rating that best indicates how you feel about the following examination structures:

	<i>Strongly</i> <i>Favor</i>	<i>Favor</i>	<i>Neutral</i>	<i>Against</i>	<i>Adamantly</i> <i>Against</i>	<i>Unsure</i>
1. One section (format could be all-objective or combination of objective and essay/problem/simulation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Two sections (format could be all-objective or combination of objective and essay/problem/simulation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Three sections; Hierarchical (all-objective prerequisite section before being allowed to take the two essay sections)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Four sections (same as current examination. Format would be combination of objective and essay/problem/simulation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Three sections (incorporating the content of the current Business Law & Professional Responsibilities section into the three remaining sections. Format would be combination of objective and essay/problem/simulation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments \_\_\_\_\_

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F. If you favor conversion of the CPA Examination to a CBT, please check the rating that best indicates how you feel about the following examination formats:

	<i><b>Strongly Favor</b></i>	<i><b>Favor</b></i>	<i><b>Neutral</b></i>	<i><b>Against</b></i>	<i><b>Adamantly Against</b></i>	<i><b>Unsure</b></i>
1. Four-option multiple choice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Other objective answer formats (OOAFs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Essay-type questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Problem-type questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Simulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments \_\_\_\_\_

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G. Please indicate, by placing a check in the appropriate column, what you believe are the two greatest benefits of computerized testing.

<b><i>Benefits</i></b>	<b><i>Greatest Benefit</i></b> <i>(Please check only one box)</i>	<b><i>Second Greatest Benefit</i></b> <i>(Please check only one box)</i>
1. Test research, recognition, judgment skills		
2. More complex questions		
3. Increased measurement precision		
4. Increased accuracy of recording candidate answers		
5. Simplification of board workload		
6. Improved examination security		
7. Enhanced administration conditions		
8. Increased examination flexibility—more than two prescribed dates		
9. Reduction in testing time		
10. Quicker grade reporting		
11. Reduced handling of question and answer materials		

Comments \_\_\_\_\_

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- H. Please indicate, by placing a check in the appropriate column, what you believe are the two greatest impediments to computerized testing.

<i><b>Impediments</b></i>	<i><b>Greatest Impediment</b></i> (Please check only one box)	<i><b>Second Greatest Impediment</b></i> (Please check only one box)
1. Examination fees charged candidates		
2. Contracting of examination administration		
3. Change statutes or regulations		
4. Availability and approval of computer sites		
5. Possible (currently unknown) legal issues		

Comments \_\_\_\_\_

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- I. On-demand examination administration appears to require an all-objective examination, as opposed to an examination that includes essay/problem/simulation type questions. Do you favor an all-objective examination, administered on demand, or do you favor an examination that includes essay/problem/simulation type questions, administered fewer times a year on common dates? (please check one)

- ☐ All-objective, on-demand
- ☐ Essay/problem/simulation questions a few times a year

Comments \_\_\_\_\_

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J. Other Comments.

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***Return this response form by February 15, 1996 to the address below:***

Board of Examiners  
c/o James D. Blum, Director, Examinations Division  
American Institute of CPAs  
Harborside Financial Center/201 Plaza Three  
Jersey City, NJ 07311-3881

# APPENDIX B

## Legislative Considerations in Moving to a Computer Based Uniform CPA Examination

As we move toward the computerized CPA Examination, each jurisdiction must consider that there are certain policies, rules, and laws that may need to be amended or otherwise addressed. Although the examination provider must attempt to design a computerized examination to accommodate the generic requirements of most state laws, this may prove to be an unattainable goal. If computer-based testing is to examine an up-to-date body of knowledge to reflect today's needs and today's technology, jurisdictions may find it necessary to amend their laws and regulations. It is not too soon for jurisdictions to begin the process of reviewing current laws and rules. Following is a partial list of the questions state boards need to address before the Uniform CPA Examination is converted to a computerized examination. These include:

- 🔊 **Is a written examination required by statute?** In some jurisdictions a computerized format will be easily implemented under current law; in other jurisdictions, the law may need to be amended to allow for a computerized examination.
- 🔊 **Will the date, time, and place of the examination need to be changed?** A jurisdiction whose law is specific in these areas would have to have new statutory language to allow for an on-demand examination.
- 🔊 **Are the current requirements for the testing of subject areas generic enough to accommodate any structure?** Some jurisdictions may have specific provisions for the testing of certain subjects (AUDIT, FARE, ARE, LPR). The specific subjects to be tested under the computerized structure may vary. Thus, each jurisdiction may wish to develop generic language that would allow for the testing of any subject in any structure.
- 🔊 **Will the conditioning requirements language need to be changed?** Is the law structured so that passing two parts at a single examination is required? If so, the statute may require an amendment to accommodate a new structure in which the traditional four parts may not be used.
- 🔊 **What are the passing and minimum scores?** If a jurisdiction's laws, rules, or policies require a specific passing or minimum score, they may need to be amended to allow for flexibility in the passing or minimum scores.
- 🔊 **What is the policy for re-examination?** If on-demand or more frequent testing is allowed, each jurisdiction must develop a re-examination policy, since there may no longer be a six-month period between examinations.

- 🖱️ **How will the jurisdiction communicate the information about the computerized examination to candidates?** Candidates (as well as colleges and universities) must be made aware well in advance about the changes to the examination.
- 🖱️ **Does the accountancy statute or other state law have restrictions on the examination fees?** In addition to the jurisdiction's accountancy statute, which may impose a ceiling on the fee that may be charged to take the examination, other less obvious laws (such as the appropriations bill) need to be checked for restrictions in fee charges for examination candidates. For instance, in one state, the appropriations bill states, "All examination fees, including the cost of the examination, shall be collected by state agencies and the payment for the examination cost shall be paid from funds appropriated to the agency."



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